

## **SUPER TYPHOON MIKE (27W)**

### **I. HIGHLIGHTS**

Mike, one of the most intense and destructive tropical cyclones of 1990, caused havoc in western Carolines and in the central Philippine islands. Although basically a west-northwestward "straight runner," it posed numerous forecast challenges due to frequent direction, speed and intensity changes. As a result of the devastation and death in the Republic of the Philippines, Super Typhoon Mike's name was retired from the JTWC naming list.

### **II. CHRONOLOGY OF EVENTS**

- 060600Z – First mentioned on Significant Tropical Weather Advisory as an area of persistent convection with an estimated minimum sea-level pressure of 1008 mb.
- 061530Z – Tropical Cyclone Formation Alert based on rapidly improving outflow and curvature, an increase in central convection, and a CI 1.0 estimate.
- 071200Z – First warning issued due to continued increase in convection and good outflow in all quadrants. Synoptic data indicated minimum sea-level pressure of 1002 mb.
- 080000Z – Upgraded to tropical storm because synoptic data indicated 35 kt (18 m/sec) around the system.
- 090000Z – Upgraded to typhoon due to formation of an eye and a CI 4.5 estimate.
- 101200Z – Upgraded to super typhoon based on a Dvorak current intensity of 7.0, a small 15 nm (24 km) diameter symmetrical eye, and good outflow in all quadrants.
- 101800Z – Peak intensity - 150 kt (77 m/sec) - established with a CI 7.5.
- 121200Z – Downgraded from super typhoon status due to interaction with land, the eye had become ragged and cloud-filled, and the temperature at the top of the convection around the eye had warmed.
- 161200Z – Downgraded to tropical storm based on interaction with Vietnam coast and degraded satellite cloud signature due to increased vertical wind shear.
- 171200Z – Downgraded to tropical depression due to synoptic reports of weak winds and rising surface pressures, and disorganized cloud signature.
- 180000Z – Final warning (dissipated over land).

### **III. TRACK AND MOTION**

Mike initially tracked west-northwestward under the influence of the mid-tropospheric subtropical ridge to the north. While undergoing rapid intensification on 9 November, it slowed and tracked west-southwestward (Figure 3-27-1). The reason for this change was not apparent, but could be related to the temporary effect of rapid intensification on the environment, and conversely the environment's adjustment to the massive release of latent heat. At 101200Z, Mike resumed its west-northwestward track which took it across the central Philippine islands and into the South China Sea. On 15 November, it turned north-northwestward toward a weakness in the subtropical ridge (Figure 3-27-2). This track took Mike across the western side of Hainan Dao and into southern China, where it dissipated.

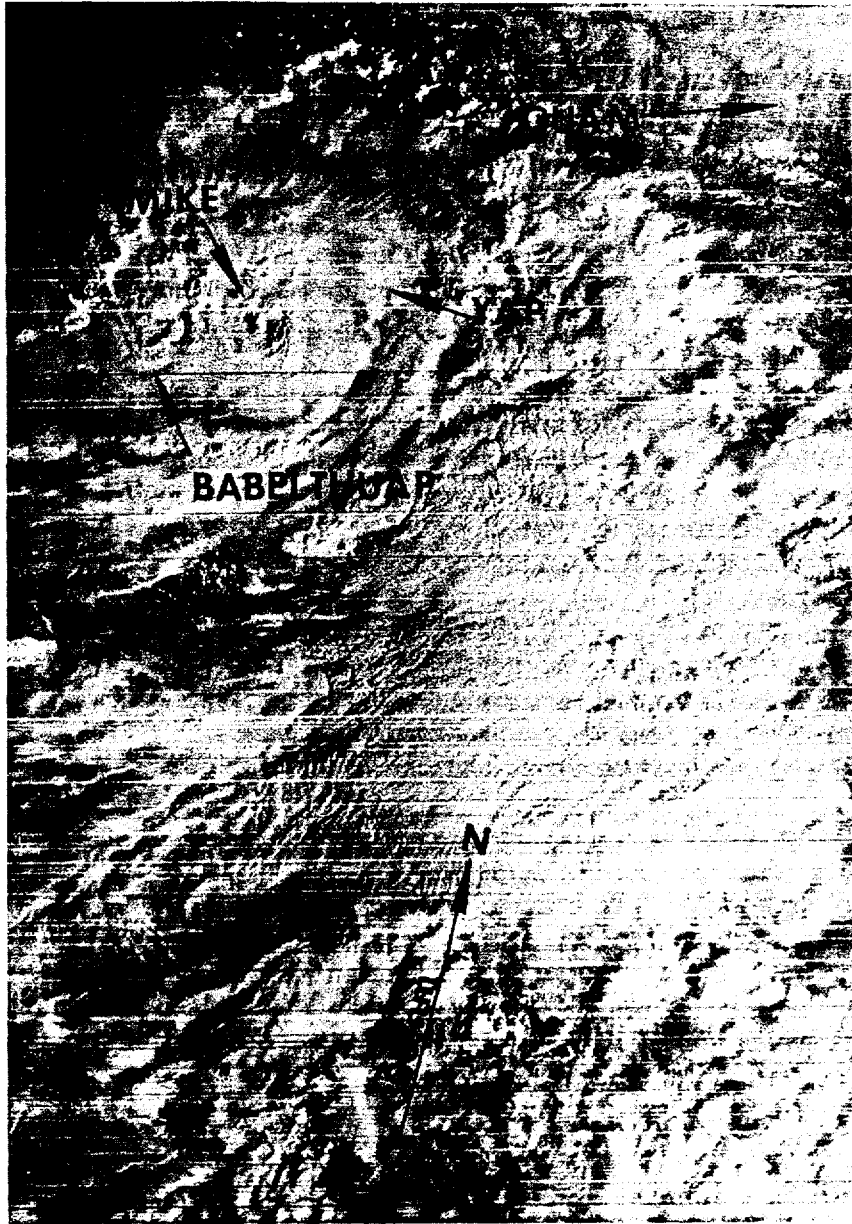


Figure 3-27-1. Mike is rapidly intensifying into a super typhoon as it passes through the western Caroline Islands ( 092106Z November DMSP visual imagery).

#### IV. INTENSITY

Mike intensified at a normal rate of T-number per day until reaching moderate tropical storm status at 081200Z. Then intensification accelerated and reached a peak of 150 kt (77 m/sec) at 101800Z. The maximum sustained surface winds increased an additional 95 kt and the estimated minimum sea-level pressure fell 99 mb to 885 mb (Figure 3-27-3) during this 48-hour period. A 200-mb trough to the northeast and broad cross equatorial flow to the south and southwest of Mike provided dual outflow channels that efficiently supported intensification. As Super Typhoon Mike approached landfall in the central Philippine Islands on 12 November, it weakened to just under super typhoon intensity at 121800Z due to the disruptive affects of the mountainous island chain across its path. After further weakening to 80 kt (40 m/sec), the typhoon reintensified to 85 kt (42 m/sec) at 141200Z over the open waters of the South China Sea. As Mike turned north-northwestward off the coast of Vietnam, increased vertical shear started the weakening process again. Dissipation followed on 18 November over southern China.

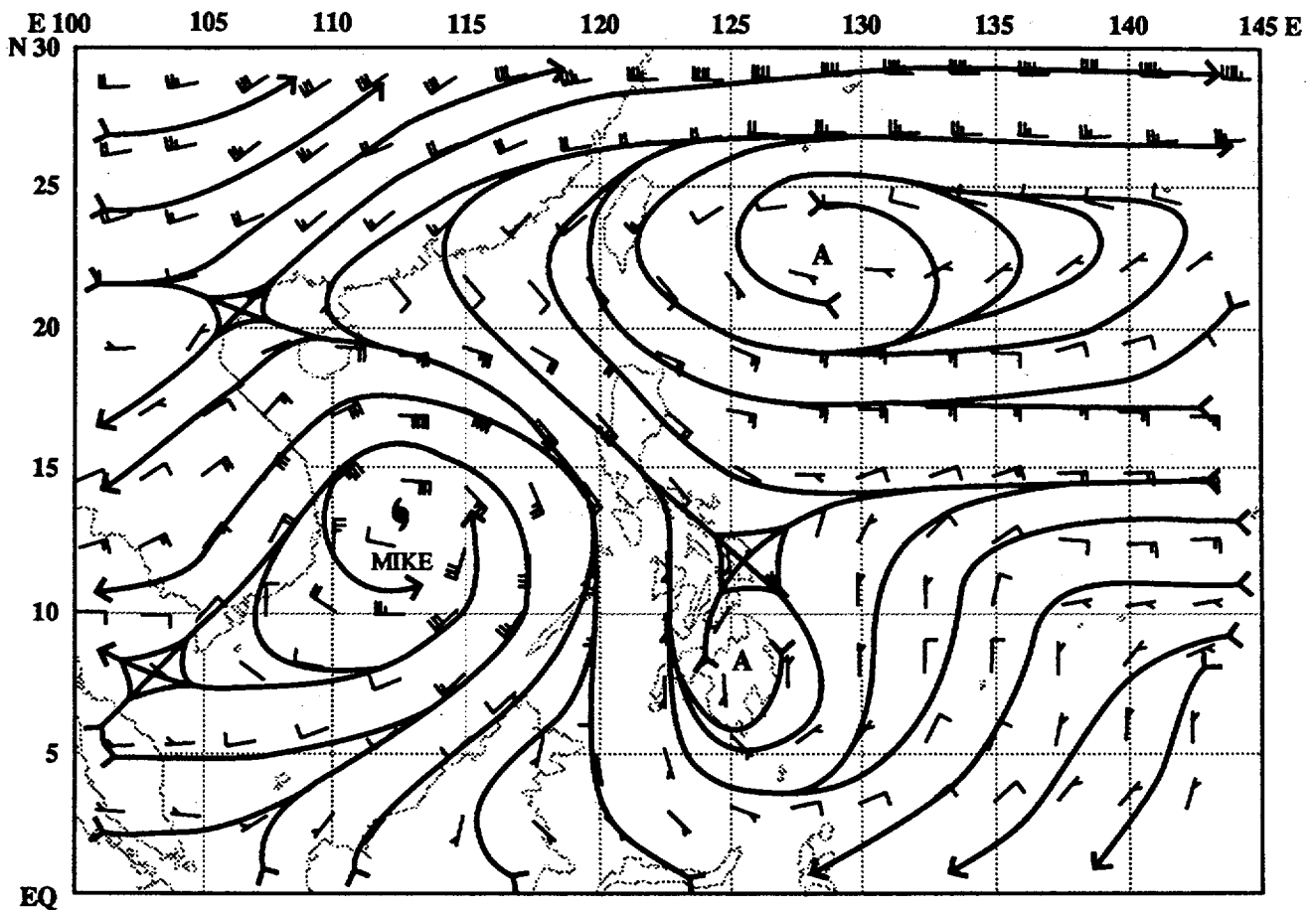


Figure 3-27-2. The deep layer mean analysis for 150000Z November shows Mike and the weakness in the subtropical ridge to the northwest.

## V. FORECASTING PERFORMANCE

The overall JTWC forecast performance with respect to the best track is shown in Figure 3-27-4. Initially, JTWC forecast the tropical cyclone to move towards the northwest into the central Philippine Sea. At 091200Z, JTWC introduced a moderate probability alternate scenario of movement across the Philippine Islands, although the NOGAPS prognostic series continued to indicate that a weakness would develop in the ridge just east of Luzon. At 100000Z, it was apparent that Typhoon Mike was moving west-southwestward as the system approached Palau. Mike was expected to resume its west-northwestward track within 24 hours. The prognostic series continued to indicate a weakness in the subtropical ridge, and JTWC continued to forecast northwest motion. However, at the 120000Z, the NOGAPS prognostics changed to reflect a stronger subtropical ridge north of Mike, and subsequently JTWC forecasts reflected motion across the central Philippines, rather than up the east coast of Luzon. As Mike continued west-northwestward into the South China Sea, forecasters expected it to make landfall in Vietnam. Again, the models provided erroneous guidance. The prognostic series failed to predict the weakness that eventually developed in the subtropical ridge to the north (see again Figure 3-27-2).

Mike's favorable outflow pointed to rapid intensification, which was in fact forecast. Despite the fact that there are no objective aids, or hard and fast rules of thumb, to predict the exact rate or peak intensity, the forecast of 130 kt (67 m/sec) maximum was made 48 hours before Mike actually peaked at 150 kts (77 m/sec). Later as Mike approached the Philippine Islands, preliminary results from a climatological study of tropical cyclones crossing the Philippines correctly indicated that it would weaken to 85 kt (44 m/sec), enabling JTWC to issue a perfect 72-hour intensity forecast.

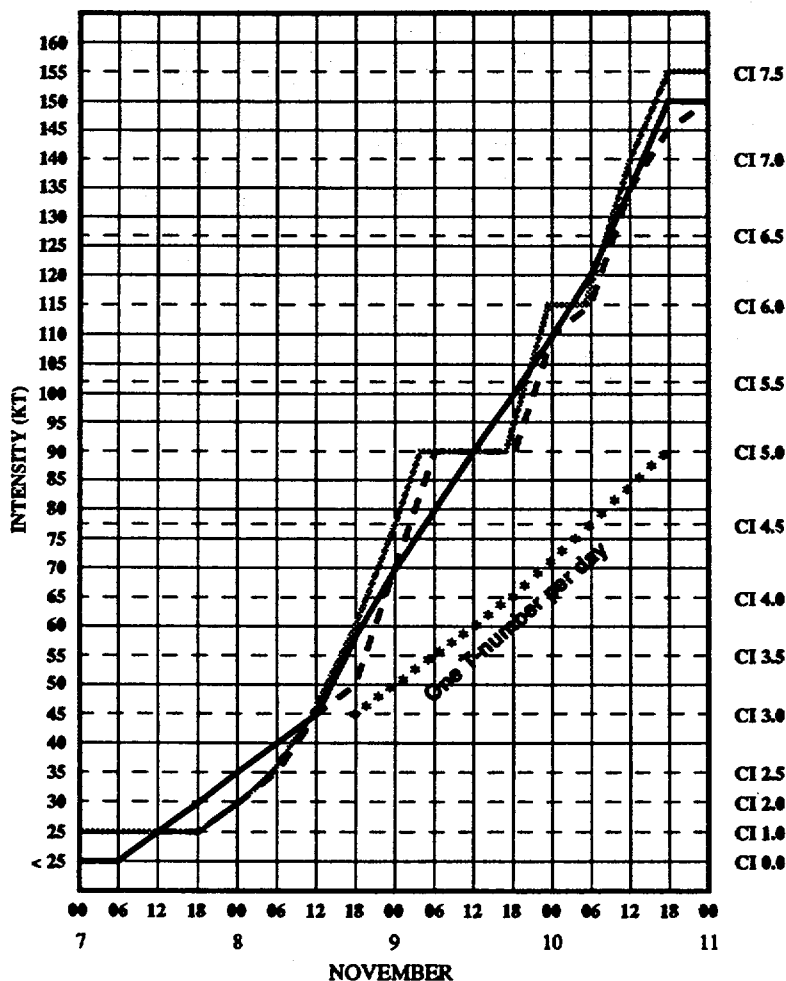


Figure 3-27-3. Plots of the satellite current intensity values (gray line), actual warning intensities (dashed line), and final best track (solid line) on a time-intensity comparison chart depict Mike's greater than normal rate of intensification after 081200Z. The normal development of one T-number per day (starred line) is included as a reference.

## VI. IMPACT

Super Typhoon Mike was extremely destructive to the western Carolines and central Philippine Islands. On Koror, 45 nm (85 km) south of Mike's center, many roofs were lost and extensive damage occurred to boats, greenhouses, aquiculture projects, fruit trees and vegetable gardens. Fortunately there were no fatalities and only one serious injury was reported. Power, water and telephone services were completely out and roads were blocked by fallen trees. The National Weather Service Office at Koror (WMO 91408) recorded maximum wind gusts to 72 kt (36 m/sec), a minimum sea-level pressure of 980.5 mb and 9.8 inches (250 mm) of rain. Closer to Mike's center, where maximum wind gusts were estimated to range from 135 to 165 kt (69 to 85 m/sec), Kayangel Island just to the north of Babelthup was almost totally devastated. Many people lost everything. Most trees used for subsistence were destroyed, with some, such as breadfruit, expected to take up to ten years to replace.

Super Typhoon Mike became the most powerful typhoon to strike the Philippine Islands this year and was reported to be the most devastating to hit the country since 1981. In the central Philippine islands at least 250 people were reported dead or missing, mostly from landslides, and 2 million people were forced from their homes into temporary shelters. Over 37,000 houses were destroyed, and at least \$14 million worth of damage was recorded. Cebu city, the commercial and transportation capital of the region, was severely damaged and more than 57 water craft, mostly in the port of Cebu, sank.

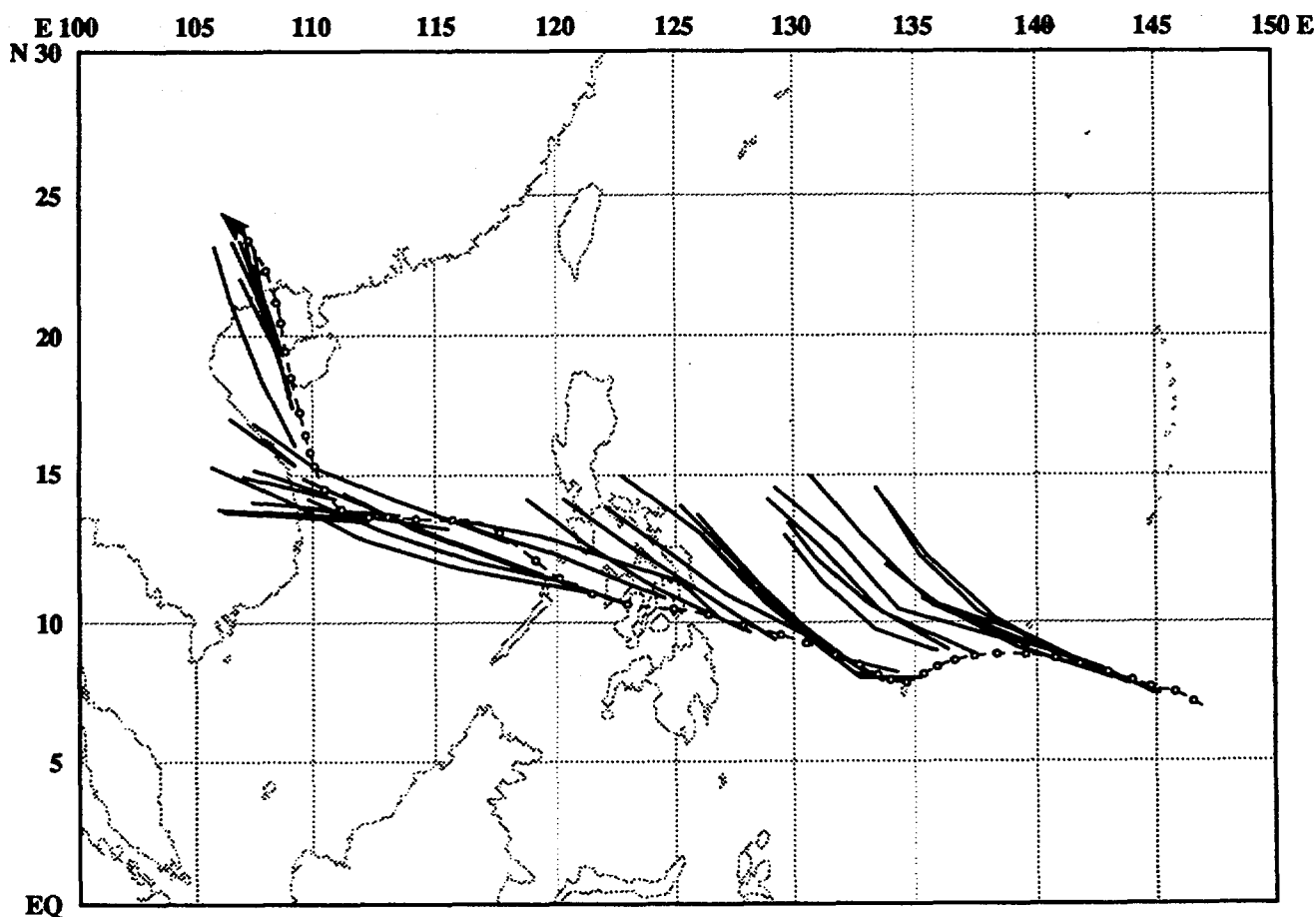


Figure 3-27-4. The JTWC forecasts (solid lines) for Mike superimposed on the final best track (dashed line).